themselves. In agreement with BROWN and ESCOMBE, he states that loss of water vapor from leaves is through static diffusion, and that it is proportional to the differences of density of the vapor inside and outside the leaf. RENNER urges, as a thing of great importance, that the rate of diffusion will be inversely modified by an increase in the distance between the region of minimum density outside the leaf and the maximum density within the leaf. It is with methods by which this distance is modified that he is mainly interested. If the distance is great, the gradient is low and the flow is slow; if the distance is small, the gradient is high and the flow fast. One way in which this distance is increased in still air is by the water vapor cap which forms over the surface of the leaf. The larger the leaf, the greater the average thickness of the vapor cap. For this reason, in still air the amount of transpiration does not vary with the surface of the mature leaves, but is proportionally less for the larger leaves. RENNER believes that if the air were absolutely still it would vary as the diameter of the leaves.

Winds increase the transpiration of small mature leaves by a much greater percentage than it does the large ones. In wind the transpiration is proportional to the surface of the leaves. Again, the distance between the internal maximum vapor pressure and the external minimum may be increased by external or by substomatal cuticular cavities; if of the same size and shape, RENNER finds that the two have equal effects.

RENNER devised a means of experimentation by which he located the point of saturation within a rapidly transpiring leaf. He believes it often lies some distance from the stomata. In such cases a considerable system of intercellular spaces is involved in the diffusion. He emphasizes the fact that in such cases the stomata, if open, are only a small part of the diffusion canals, and therefore play a small part in the control of transpiration. In a similar way their importance as controlling factors is modified by internal and external cuticular chambers, and even by the vapor cap.—WILLIAM CROCKER.

Infection experiments with rusts.—In a preliminary report of some infection experiments made near Neuenburg (Switzerland), MÜHLENTHALER[34] shows that teleutospores of the *coronata* type of *Puccinia* from *Calamagrostis varia* produced aecidia on *Rhamnus alpina* and *R. Purshiana*. Aecidiospores from these reinfected *Calamagrostis varia* and *C. tenella* among several grasses tried. Aecidiospores collected on *R. cathartica* produced uredospores on *Bromus erectus* var. *condensatus*, *Festuca alpina*, *F. arundinacea*, *F. gigantea*, and *F. varia*. The uredospores thus produced on *Bromus erectus* var. *condensatus* could be transferred to *B. erectus* and its var. *condensatus*, *B. inermis*, *B. sterilis*, and *B. tectorum*.

In continuation of his cultural work on the Uredineae, ARTHUR[35] reports

[34] MÜHLENTHALER, F., Infektionsversuche mit Kronenrosten. Centralbl. Bakt. II. **26**:58. 1910.

[35] ARTHUR, J. C., Cultures of the Uredineae in 1909. Mycologia **2**:213–240. 1910.

the results of cultures of 1909, marking the beginning of the second decade of the work. In the season covered by the report, 15 species of rusts were each sown on a large number of aecidial hosts with negative results. Sowings of 23 species were made supplementing or confirming previous work of the author and others. Of special interest among these is the sowing of *Calyptospora columnaris* on potted plants of *Abies Fraseri*. The successful culture of the aecidia on *Abies* led to the subsequent discovery of the native aecidial form on *Abies balsamea* in Nova Scotia, whence the original *Calyptospora* material had been obtained. This collection of the aecidia by Professor FRASER is the first from America. Of teleutospore forms connected for the first time with aecidial forms, 6 are reported. These are *Puccinia Ceanothi* (Ellis and Kellerm.) Arth. on *Andropogon Hallii* Hack. and *Ceanothus americanus* L.; *Gymnosporangium exiguum* Kern on *Juniperus virginiana* L. and *Crataegus Pringlei* Sarg.; *G. corniculans* Kern on *J. horizontalis* Moench, *Amelanchier erecta*, and *A. canadensis* (L.) Medic.; and *G. trachysorum* Kern on *J. virginiana* L., *Crataegus punctata* Jacq., *C. coccinea* L., and *C. cerronis* A. Nels.—H. HASSELBRING.

Rate of photosynthesis.—THODAY[36] comes to the defense of the increased weight method of SACHS for determining the rate of carbon fixation in green plants. He thinks he has worked out the details of the method so as to insure quantitative accuracy. One cannot see how it will lead to more accurate results than the method described in GANONG'S *Plani physiology* (2d ed., pp. 92–97. 1908). In fact, it seems that THODAY'S experimental error must be greater than GANONG'S, due to the small leaf surface used. We know little about what occurs in a leaf subjected to illumination. As BROWN and ESCOMBE suggest in stating their CO_2 intake method, it may modify the power of various contained compounds to hold water at 100° C. Since the amount of atmospheric CO_2 fixed is the question to be answered, the reliability of the increased weight method must be measured by its agreement with the amount of CO_2 taken up under like conditions. It would seem as though the work better be done on perfecting the CO_2 intake method, if indeed BROWN and ESCOMBE did not leave it so. This method is entirely independent of asymmetry, of variation of surface with insolation, and of translocation and changes in the water-holding powers of the leaf. It also measures directly the thing sought. THODAY depended upon the horn hygroscope as a means of determining the condition of stomata. The results obtained with this instrument are at best only indirect and qualitative, as LLOYD[37] has suggested. The direct and accurate method devised by LLOYD is certainly preferable.—WILLIAM CROCKER.

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[36] THODAY, D., Experimental researches on assimilation and respiration in the open air. Proc. Roy. Soc. London B **82**:421–450. 1910.

[37] LLOYD, F. E., Physiology of stomata. Publ. 82, Carnegie Institution. 1908.